**Lesson Title: Productive Struggle**

**Objectives:**

Students will be able to reflect on their thought process during a complex task.

***CRS Student Attributes***

Demonstrate intellectual engagement

Persevere when faced with time-consuming or complex tasks

**Purpose:**

Research indicates that students need to wrestle with difficult problems to become better problem-solvers. By providing students with these opportunities, they will learn to achieve at a higher level. As instructors, we need to find the fine line between how much we allow them to struggle and when to provide support. When their struggles are productive they will learn to be persistent in problem-solving.

**Brief Description of Activity:**

Students will be provided with a complex task and use productive struggle protocol to monitor their progress.

**Materials Needed:**

Handouts: *Productive Struggle Protocol Sheet*

*Productive Struggle Reflection Sheet*

**Sequencing Recommendations:**

Various productive struggle activities should be implemented periodically throughout the quarter, with the first occurring within the first two weeks. The productive struggle protocol handouts can also be used at any point with assigned work.

**Research/Resources:**

**Activity: Gas Problem**

1. Begin with posing the question “what can be determined by the graph?” **(Handout 1 – Multi-lined graph)** - Other possible statements may include “there are lots of possible answers, what do you notice?” Students work independently.
2. Have students answer questions from ***Productive Struggle Protocol Sheet***  **(Handout 2)**
3. Students share their responses with a partner. Bring class back together to discuss responses. Instructor makes overall list.
4. **Handout 3 (One line with coordinates)** - again pose the question “what can be determined?” Students work independently. Again, have students answer questions from ***Productive Struggle Protocol Sheet***  **(Handout 2)**
5. Students share their responses with same partner. Bring class back together to discuss responses.
6. Back to **Handout 1 (original graph),** ask students to assign values to ordered pairs for each of the lines that make most sense to them and that are consistent with the known points. Students work independently.
7. Students again share responses with same partner.
8. Students complete ***Productive Struggle Reflection Sheet*** **(Handout 4)** to reflect on entire process.

**EXTENSIONS:**

This activity can be adapted to include mathematical content related to individual course objectives.